sociological science

Opportunities for Faculty Tenure at Globally Ranked Universities: Cross-National Differences by Gender, Fields, and Tenure Status

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Abstract: Drawing on a unique data set of almost 12,000 faculty members from 52 globally ranked universities in four fields (sociology, biology, history, and engineering), this study describes and explains gender differences in tenure among faculty across 13 countries. In our sample, women comprise roughly one-third of all faculty and only 23 percent of tenured faculty, with significant variation across fields and countries. Findings from a series of multilevel regression analyses suggest support for a gender filter argument: women are less likely to be tenured overall and in every field. Opportunities for tenure also matter. In countries with very low- and high-tenure rates, women are much less likely to be tenured relative to men than in countries with pathways both into and upward in academia.

Keywords: higher education; gender; faculty; tenure; cross-national; STEM fields

Reproducibility Package: A replication package with all original data and codes is available at https://doi.org/10.25740/yj064dj4349.

In March 2013, participants of the "Action for Women in Higher Education Leadership" session at Going Global 2013 endorsed a "Manifesto for Change," calling for the inclusion of gender equality as a key performance indicator for international higher education institution rankings (Forestier 2013; Morley 2018). The manifesto included other critical measures to increase women in research, faculty positions, and academic leadership, including the creation of a global database on women in different levels of higher education institutions. These initiatives represent a prominent challenge being tackled across universities worldwide: although women increasingly outnumber men as students in higher education, they continue to be underrepresented as faculty—the creators and disseminators of knowledge—particularly in high-status tenure-track positions and in many fields of study.

Scholars agree that diversity allows universities to draw from a broader range of intellectual capital, resulting in the production of more innovations, influential research, and global standards of excellence (Ginther and Kahn 2009; Stewart and Valian 2018). It is argued that universities ought to resemble the student population, which is now over half women (McDaniel 2012; UNESCO 2012) and increasingly diverse in a variety of other characteristics (David 2016). Furthermore, same-gender role models increase women's and men's participation and performance in higher education (Agathangelou and Ling 2002; Bettinger and Long 2005; Sax, Bryant, and Harper 2005). However, getting into the faculty door is half the battle. Only with tenure, or the equivalent, women have academic freedom and the same power, legitimacy, and access to resources as men.

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Despite the undeniable growth of women faculty over the past several decades across all world regions (Wotipka, Nakagawa, and Svec 2018), many obstacles remain to women's full equality in higher education, including in tenured positions (Mischau 2001; Morley 2012, 2014). Although global and regional efforts to address gender disparities in higher education have expanded over the past several decades, significant national differences persist due to institutional structures and gender biases in fields of study. Academic careers are shaped by both national traditions and global advancements (Finkelstein and Jones 2019).

In this article, we argue that national opportunities for tenure and gender representation of fields can explain women's representation among tenured faculty. In particular, we focus on the importance of opportunities for tenure. In countries where the process to obtain these highest status positions is more formalized (Van Balen et al. 2012) or where gaining tenure for everyone is more difficult, women will be underrepresented among the ranks of tenured faculty. In addition, due to the "gender filter" (Blickenstaff 2005), women are less likely to be in tenured faculty positions in fields where fewer women are represented as students, namely in science, technology, engineering, and math (STEM).

This article describes and explains gender differences in tenure among faculty in a sample of globally ranked universities across 13 countries[1]: Australia, Brazil, China, Germany, Israel, Japan, Mexico, the Netherlands, the Republic of Korea (hereafter South Korea), Sweden, Turkey, the United Kingdom, and the United States. The goal is to examine why, despite the tremendous growth of women faculty over time (Wotipka et al. 2018), gender disparities among tenured faculty persist. Drawing on a unique data set of close to 12,000 faculty members from 52 globally ranked universities in four fields, this study provides an unprecedented analysis of the representation of women faculty in tenured positions cross-nationally. From here on, we refer to senior faculty ranks as "tenured" and junior faculty ranks as "non-tenured," which may include both those on the tenure track and those not on the tenure track, for example, adjuncts. As ranking systems of faculty positions vary worldwide, this classification is used to enable cross-national comparisons on standards that are as equivalent as possible.

Furthermore, we examine what structural features of higher education systems contribute to the varying levels of gender inequality in the academic profession across sociology, biology, history, and engineering. We choose these fields to have a range of disciplines—two social science and humanities fields and two STEM fields—which vary regarding women's representation within them. Because engineering is often an entire school with many subdepartments, we focus on mechanical engineering.

Academic Tenure

Alongside changes in American universities, including the establishment of graduate schools and learned societies, and influenced by their counterparts in France and Germany, academics in the United States formally established tenure in 1940 for university faculty to safeguard academic freedom in their research and teaching (Ludlum 1950). Over the ensuing years, universities worldwide enacted some form

Table 1: Academic ranks through fifth rank by country.

Country	Top Rank	Second Rank	Third Rank	Fourth Rank	Fifth Rank
Australia	Professor + associate professor	Associate professor	Senior lecturer	Lecturer B	Lecturer A
Brazil	Titular (full professor)	Associado (associate)	Adjunto (adjunct)	Assistente (assistant)	Auxliar (auxiliary personnel)
China	Professor	Associate professor	Lecturer	Teaching assistant[1]	
Germany	Professors: full professors or chair holders	Professors: professors without chair; mostly tenured or tenure track[2]	Professors: former senior assistant and junior professors[3]	Researchers, lecturers	Teaching Staff for Special Tasks
Israel	Full professor	Associate professor	Senior lecturer	Lecturer	
Japan	Professor	Associate professor	Lecturer	Assistant professor	Research assistant
South Korea	Professor	Associate professor	Lecturer	Assistant professor	Research assistant
Mexico	Profesor/Investigador Titular C	Profesor/Investigador Titular B	Profesor/Investigador Titular A	Profesor/Investigador Asociado C	Profesor/ Investigador Asociado B
Netherlands	Professor	Senior lecturer	Lecturer	Instructor; doctoral candidate	
Sweden	Full professor (chair)	Professor	Docent	Universitetslektor (senior lecturer)	Universitetsadjunkt (lecturer)
Turkey	Professor	Docent	Assistant docent	Research assistant	Lecturers and instructors
United Kingdom	Professor	Reader	Senior lecturer	Lecturer	
United States	Professor	Associate professor	Assistant professor	Adjunct professor	Lecturer

Source: Authors' self-collected data from institutional websites and personal communication, Altbach et al. (2012), and Finkelstein and Jones (2019).
Note: Shaded cells are considered the U.S. equivalent of "tenured" positions. [1]In some cases, this is assistant professor or associate lecturer, [2]equivalent to U.S. associate professor, and [3]equivalent to U.S. assistant professor.

of tenure or permanent employment for faculty. Although differences in qualifications and expectations, as well as process and time to tenure, vary greatly across countries (Finkelstein and Jones 2019; Teichler, Arimoto, and Cummings 2013), obtaining tenure is universally considered a significant achievement in one's career associated with status, prestige, stability, and opportunities for advancement. It is also increasingly more difficult to obtain given the growing number of non-tenure-track positions across academia globally, including in the United States where over half of faculty positions are non-tenure track (Finkelstein, Conley, and Schuster 2016).

It is essential to clarify how we define "tenured" faculty positions across the 13 countries in our cross-national study. To begin, we selected four fields (departments) from four universities per country to arrive at close to 12,000 university faculty members (a list of universities included in the study and the sampling procedure are available upon request).[2] The data were collected by the first author and a research assistant between February and July 2014 by visiting each departmental website. As shown in Table 1, we coded the academic ranks of each faculty member as of 2014 using the classifications of professor rankings constructed by Altbach et al. (2012) and later confirmed by other sources (e.g., Finkelstein and Jones 2019). Shaded cells indicate positions considered permanent or "tenured" equivalent in their respective countries. As definitions of tenured or permanent faculty varied across countries and institutions within countries, employment and promotion guidelines were consulted at each university in our study. In addition, scholars from each of these countries verified the validity of the classifications. The impact of these international variations is detailed in the subsequent sections.

Literature and Arguments

To understand gender differences in tenured faculty across four fields and countries with diverse higher education systems, we simultaneously consider the literature and arguments concerning national opportunities for tenure and growth and obstacles for women in higher education, including gendered differences by fields.

Structural Differentiation: Opportunities for Tenure

As evident from Table 1, tenure and promotion systems of academics vary across countries. On the one hand, countries have similar ranks, with an academic career beginning with acquiring a doctoral degree, rising to a fixed-term research or teaching contract, and eventually reaching a permanent, tenured position. On the other hand, variations exist in the number of ranks, the length between ranks, and criteria for promotion, among other characteristics (Altbach 1996; Altbach et al. 2012; Musselin 2005; Teichler et al. 2013). We argue that women find it more challenging to gain tenure in systems in which tenured positions are rarer or more onerous to land. Because tenured faculty often hold their positions for decades, in systems where tenure-track positions are rare, women may have fewer opportunities to enter the system. Moreover, the time trade-off between the two "greedy institutions" of academic careers and child-raising is more likely to deter women as they consider whether to pursue tenure-track faculty positions (Currie, Thiele, and Harris 2002; Mason, Wolfinger, and Goulden 2013; Wolf-Wendel and Ward 2006).

For example, in Europe, promotions commonly occur only when a higher tenured position becomes available. In Germany, few tenure positions are available, despite institutions attempting to change the requirements to land a faculty position and tenure (Kehm 2019). Recognizing that the opportunity to grow into tenured positions is a critical draw for younger promising academics, Dutch universities, for example, have increasingly adopted the tenure-track system (Teichler et al. 2013); for the time being, the number of tenured faculty remains relatively low. At the time when our data were collected in 2014, "early permanent employment" systems in Japan and South Korea provided tenure at the time one was hired (Teichler et al. 2013:59). In between are standardized career tracks that progress toward tenure such as those found in the United Kingdom and the United States. In other systems, such as Brazil, faculty jobs are secondary careers and demand for qualified candidates is high. For those in top public institutions, tenure is granted after just a few years. The same was the case in China until recently when more rigorous tenure standards were established. Overall, we expect that systems with more tenure opportunities also offer women the best opportunities for tenured positions.

A Pipeline or Gender Filter for Faculty Positions?

A well-cited explanation for the increase in women faculty is the pipeline argument: over time, the growth of women students entering higher education leads to more women earning graduate degrees, eventually resulting in leading to more entering the academic profession as faculty, and the most meritorious, earning tenure (Glazer-Raymo 1999; White 2004; Xu 2008). With women's overrepresentation as

undergraduates and now graduate students in the higher education pipeline, one could argue that women should be more likely than men to land faculty positions, if not also tenured ones. Indeed, doctoral and postgraduate degrees are increasingly being treated as preconditions for obtaining faculty positions around the world (Teichler et al. 2013). Yet, few studies have predicted cross-national differences in the gender composition of faculty as a direct effect of the gendered composition of doctoral graduates (see Wotipka et al. 2018). In a cross-national study of academics in 19 countries, Teichler et al. (2013) show that between 1992 and 2007, the same share of women and men in junior faculty positions progressed into senior positions, suggesting that rather than women hitting glass ceilings in academia, time will eventually lead to more tenured women faculty. However, given the disproportionate numbers of men in senior faculty positions, it may take women years, if ever, to reach parity. With stark differences across countries and fields, examining which factors explain cross-national variation is critical.

In contrast to the "give it time" argument, other studies underscore the fact that the pipeline is the existence of a "leaky pipeline," whereby women academics leak out of the academic career pipeline, leading to fewer women (and more men) remaining at every subsequent level (Bain and Cummings 2000; Glazer-Raymo 1999; Van Anders 2004), particularly in male-dominated fields (Blickenstaff 2005; Hersh 2000) and leaving a smaller pool of women available to fill higher status positions. For the women who stay, "chilly climates" (Maranto and Griffin 2010) and "glass ceilings" (Rhoads and Gu 2012) disproportionately negatively affect women students and faculty. In particular, imbalances in workloads and productivity and unequal standards for publishing can slow evaluation and progression toward tenured positions (Aiston and Jung 2015; Hengel 2017; Padilla-Gonzalez et al. 2011; Park 2007; Weisshaar 2017). Combined, these factors leave women underrepresented in certain fields and tenured faculty positions (Wolfinger, Mason, and Goulden 2008). However, some evidence suggests that women may earn tenure at equal or higher rates than men in some fields, including those dominated by men (Lutter and Schröder 2016). In these cases, men may have greater opportunities outside the academic labor market, leaving room for women to succeed (Aanerud et al. 2007).

As a growing number argue, we agree that the pipeline leading comfortably to tenured positions for women is a "pipe dream" (Kellerman and Rhode 2017). Rather, the pipeline is, in fact, leaky for women. For STEM, this has been referred to as a "gender filter" (Blickenstaff 2005). The idea is that multiple and complex causes lead to fewer girls and women in STEM. And fewer women STEM graduates (Lee et al. 2024) lead to fewer women faculty, tenured or not.

Characteristics of national education systems further contribute to various forms of gender stratification in higher education. Specifically, new types of students entering higher education led to horizontal segregation across disciplines when universities began developing new fields of study (Charles and Bradley 2002; Frank and Gabler 2006; Silander, Haake, and Lindberg 2013). Women commonly entered fields considered "feminized" and, therefore, less prestigious (Charles and Bradley 2002, 2009; Ramirez and Wotipka 2001). The same is true for women faculty who are less likely to be found in STEM fields and in higher status positions within any

field, especially in men-dominated fields (van den Besselaar and Sandström 2016). This resulted in "strong segregation *within* educational institutions" (Hendley and Charles 2015:3). Given that women are less likely to be found in certain disciplines starting as students and in subsequent stages leading to tenured positions, we expect that women are less likely to be in tenured faculty positions in fields where there are fewer women represented as students.

Although this article does not predict causal explanations for the relationship and our binary variable does not allow us to measure progression along the career ladder across more than one stage (tenured or not), we expect a leaky pipeline for tenure overall and a gender filter for STEM to be at play in all countries in our study such that despite the percentages of women doctoral graduates, women faculty will be less likely to be tenured than men faculty, particularly in STEM. In our descriptive analyses, we also expect lower percentages of women relative to men in total faculty positions.

Data and Methods

To our knowledge, because there were no other cross-national data sources disaggregated by faculty rank, gender, and fields, we created a unique data set, thereby enabling us to contribute an unprecedented analysis of women's status in diverse, globally ranked universities across different professorial ranks, fields, and countries. Beginning with descriptive analyses, we examine the percentages of women faculty by tenure status, field, and country to show where women faculty reside cross-nationally. Subsequently, we conduct multilevel logistic regression analyses to examine what individual and national characteristics are associated with tenure status, as described below. We produced a replication package with all original data and codes available at Nakagawa, Wotipka, and Buckner (2024).

Dependent Variables

In the regression models, the dependent variable is a binary variable indicating tenure status in 2014, coded 1 if an individual faculty member is tenured and 0 if not. Due to the nature of our data, all non-tenured faculty were coded as 0, regardless of whether they were on a tenure track.

Independent Variables

In the descriptive analyses, we examine patterns of women faculty representation across fields and countries. In our regression models, we include independent variables to test our arguments further. At the individual level, our primary predictor of interest is gender, coded 1 for women and 0 for men. We also include a set of binary variables operationalizing field of study, with history as the reference group. At the country level, we examine the impact of national opportunities for tenure (i.e., likelihood of available tenure positions) by creating a variable that classifies countries into three categories (low, medium, and high) based on the percentage of men faculty who are tenured in the country across all four fields. In analyses

Table 2: Faculty by country, gender, and tenure status.

Country	Total Men	Tenured Men	Total Women	Tenured Women	Total Faculty	Tenured Faculty	Women (% Total)	Women (% Tenured)	Tenured (% Total)	Tenured (% Total)
Australia	618	248	419	79	1037	327	40	24	32	8
Brazil	642	300	377	181	1019	481	37	38	47	18
China	608	457	183	89	791	546	23	16	69	11
Germany	1427	241	679	47	2106	288	32	16	14	2
Israel	492	278	151	54	643	332	23	16	52	8
Japan	398	307	47	28	445	335	11	8	75	6
Mexico	429	175	324	101	753	276	43	37	37	13
Netherlands	637	170	373	37	1010	207	37	18	20	4
South Korea	374	343	36	29	410	372	9	8	91	7
Sweden	1001	412	570	161	1571	573	36	28	36	10
Turkey	192	95	165	68	357	163	46	42	46	19
United Kingdom	499	275	211	74	710	349	30	21	49	10
United States	745	404	360	171	1105	575	33	30	52	15
Total	8062	3705	3895	1119	11,957	4824	33	23	40	9

not reported here (but available upon request), we include women's share of the labor force for women ages 15 and over (World Bank 2014) and tertiary system size (UNESCO UIS 2014) as control variables. As the findings were no different from the ones reported here, they are not included in the final models.

Analytical Model

We employ a multilevel logistic regression to examine the relationships between individual- and country-level characteristics and tenure status, a binary outcome. Because individual faculty are grouped within both universities and national contexts, we calculated the intra-class correlation calculation for null models, indicating that roughly 23 percent of variation is accounted for by country-level variation and 34 percent of variation is accounted for by the combination of university and country. Due to the substantial university- and country-level variation, we employ multilevel models, allowing standard errors to account for correlated errors among women faculty from the same countries. For the purpose of this model, a random-intercept model is used to allow for random variation in the intercept across countries.

Descriptive Findings

Faculty by Gender and Rank

In Table 2, we report descriptive figures for faculty by country, gender, and tenure status. Among the total faculty in the sample across the four fields, 3895 are women (33 percent) and 8062 are men (67 percent). Japan (11 percent) and South Korea (9 percent) have the lowest representation of women academics. Among the countries with the highest proportions of women are some with the lowest levels of economic development: Turkey (46 percent), Mexico (43 percent), and Brazil (37 percent), as well as some of the richest: Australia (40 percent), Netherlands (37 percent), and Sweden (36 percent).

Overall, women are underrepresented across total faculty and in all 13 countries but more so in tenured positions. Women make up 23 percent of total tenured faculty,[3] and tenured women make up just 9 percent of total faculty, whereas tenured men make up 31 percent of total faculty. The lowest proportions of women tenured faculty are in Japan and South Korea (8 percent in both countries) and the highest proportions are in Turkey (42 percent), Brazil (38 percent), and Mexico (37 percent). The remaining countries fall within the range of 16–30 percent.

Table 2 also points to substantial cross-national variations in the percentage of total faculty (women and men) who are tenured as a share of total faculty. In East Asian countries, most faculty are tenured, with 91 percent in South Korea and 75 percent in Japan. In contrast, Germany (14 percent) and the Netherlands (20 percent) have low-tenure rates overall. In these two countries, the gap between women's share of total faculty and women's share of faculty with tenure is particularly striking.

In Figure 1, we present the tenure gap for women. For example, while women comprise 37 percent of total faculty in the Netherlands, they only comprise 18 percent of tenured faculty—less than half. The numbers for Germany are similar (32 percent vs. 16 percent, respectively). In comparison, women in the United States exhibit a smaller gap, representing 33 percent of total faculty and 30 percent of tenured faculty, and women in Turkey fare even better (46 percent vs. 42 percent, respectively). Women faculty in Brazil are more equally represented, with women's share of tenured positions slightly higher (38 percent) than women's share of total faculty (37 percent). Again, Japan and South Korea have the lowest rates of women—around 10 percent.

Women Faculty by Field of Study and Rank

Table 3 provides a closer look at the distributions of women among total faculty and tenured faculty by field. Although we see wide cross-national variation, averages across the 13 countries show that for total faculty, women make up 45 percent in sociology, 38 percent in biology, and 35 percent in history. At just 11 percent, engineering is a clear outlier. Among their share of tenured faculty, women represent 37 percent in sociology, 25 percent in biology, 27 percent in history, and just 7 percent in engineering.

In sociology, women comprise 45 percent of faculty positions overall and 37 percent of tenured positions. Turkey also represents the highest representation of women faculty, among total faculty (68 percent), but even more so among tenured faculty (77 percent). Further behind are the United States (56 percent total vs. 50 percent tenured) and Sweden (54 percent total vs. 44 percent tenured). While appearing at the low end of the spectrum, women in Japan (19 percent total vs. 15 percent tenured) and South Korea (27 percent both) fare slightly better than women faculty in China (27 percent total vs. 21 percent tenured).

In biology, women represent approximately 38 percent of faculty across the 13 countries and 25 percent of total tenured faculty. Women make up the largest percentages of faculty positions in Turkey (63 percent), Australia (47 percent), Brazil and Mexico (45 percent), and Germany (42 percent). At 10 percent, Japan and South

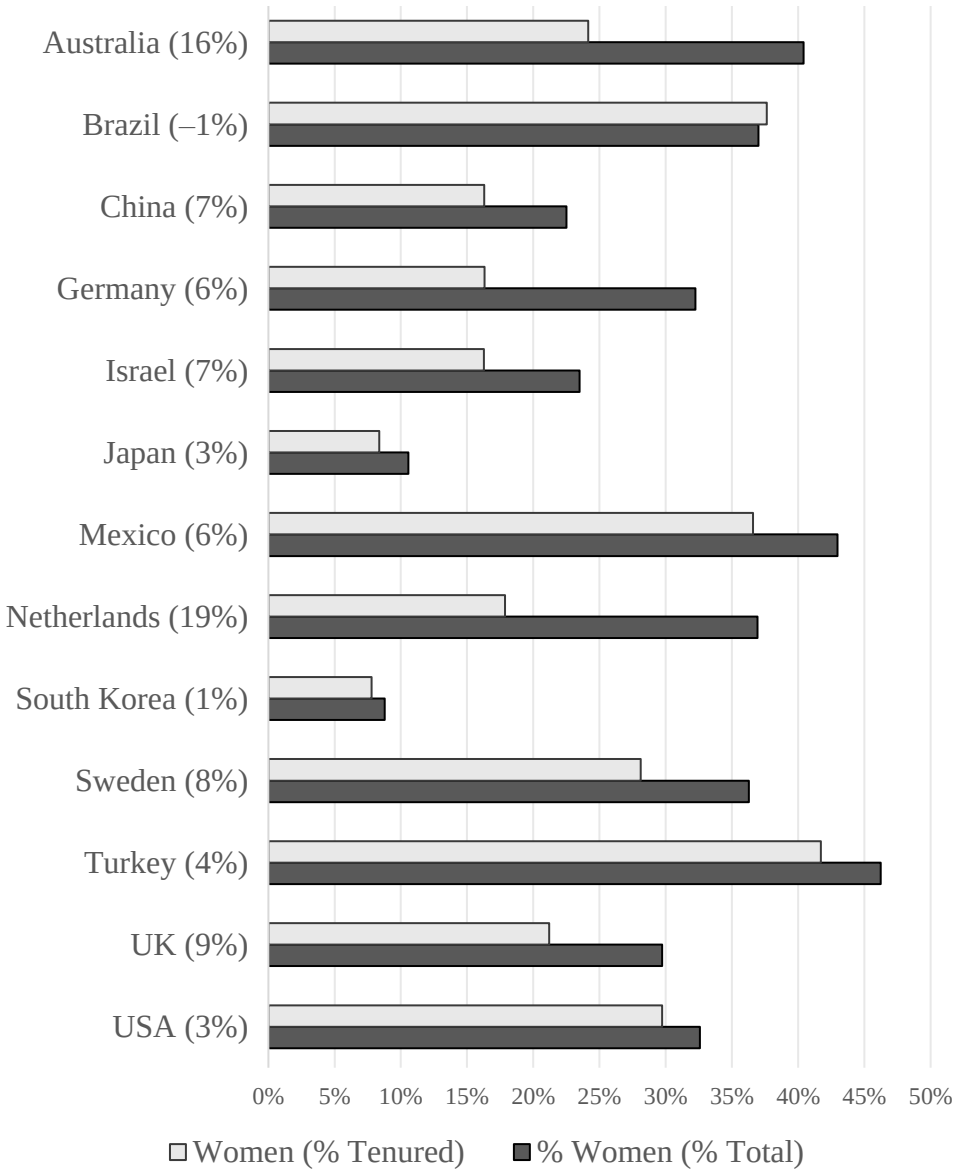

Figure 1: Tenure gap for women faculty: women's share of all faculty compared with women's share of faculty with tenure by country.

Korea represent the lowest percentages. Other countries fall between 21 percent and 42 percent. Women's share of tenured faculty in biology looks similar, ranging from 8 to 56 percent across the countries, with Turkey holding the top spot. In general, countries with higher women's share of total faculty see higher women's share of tenured faculty, except in Australia and Germany, where women's share of tenured faculty drops to 25 percent and 21 percent, respectively. Overall, women are less likely to be faculty or tenured faculty in biology than men, except for in Turkey, where women surpass men faculty in both categories.

Table 3: Share of women faculty by country, field, and tenure status (%).

	Sociology		Biology		History		Engineering	
	All	Tenured	All	Tenured	All	Tenured	All	Tenured
Australia	48	41	47	25	44	35	10	8
Brazil	36	29	45	43	41	49	8	9
China	27	21	29	22	15	6	14	8
Germany	40	22	42	21	36	16	13	8
Israel	46	44	21	15	22	18	18	5
Japan	19	15	10	8	49	50	5	1
Mexico	44	42	45	40	31	16	9	8
Netherlands	47	32	37	14	10	9	—	—
South Korea	27	27	10	8	38	35	2	2
Sweden	54	44	39	25	34	24	13	11
Turkey	68	77	63	56	35	24	10	5
United Kingdom	43	38	25	18	48	47	14	11
United States	56	50	31	27	35	27	10	7
Total	45	37	38	25	34	24	11	7

Note: In the Netherlands, tertiary-level engineering education is predominantly conducted at separate engineering institutions, so it is not included in the engineering results.

Total averages across all countries in history are very similar to those for biology. Women comprise 35 percent of total history faculty and 27 percent of faculty with tenure. In two countries where women's share of total faculty is the highest, women's share of tenured faculty is also at parity: Mexico (49 percent and 50 percent) and the United States (48 percent and 47 percent). Women's share in Brazil is high for total faculty in history (41 percent) and even higher for their share of tenured faculty (49 percent). Similar to our other findings, the figures for total faculty and tenured faculty are lowest in South Korea (10 percent and 9 percent), Japan (14 percent and 13 percent), and China (15 percent and 6 percent).

Finally, across the 13 countries, women represent only 11 percent of total faculty in engineering and 7 percent of those with tenure. Compared with the other fields, cross-national variation for engineering is minimal as the numbers are low for all countries. Women fare the best among engineering faculty in Israel at 18 percent (yet among tenured faculty, women's share is among the lowest at just 5 percent). As with the other fields, women have the lowest representation in Japan (5 percent and 1 percent) and South Korea (2 percent and 2 percent).

Overall, these results highlight several key findings. First, there is vast cross-national variation in the percentages of women faculty, with some countries consistently on the high end (Turkey, Brazil, Mexico, Australia, and United States) and others on the low end (Japan and South Korea). Second, the fields of sociology, biology, and history have relatively higher representation of women faculty, even among those with tenure. Finally, women's representation among engineering faculty, tenured or not, is very low across all countries. As our study uses data for mechanical engineering, future studies could explore a broader range of engineering

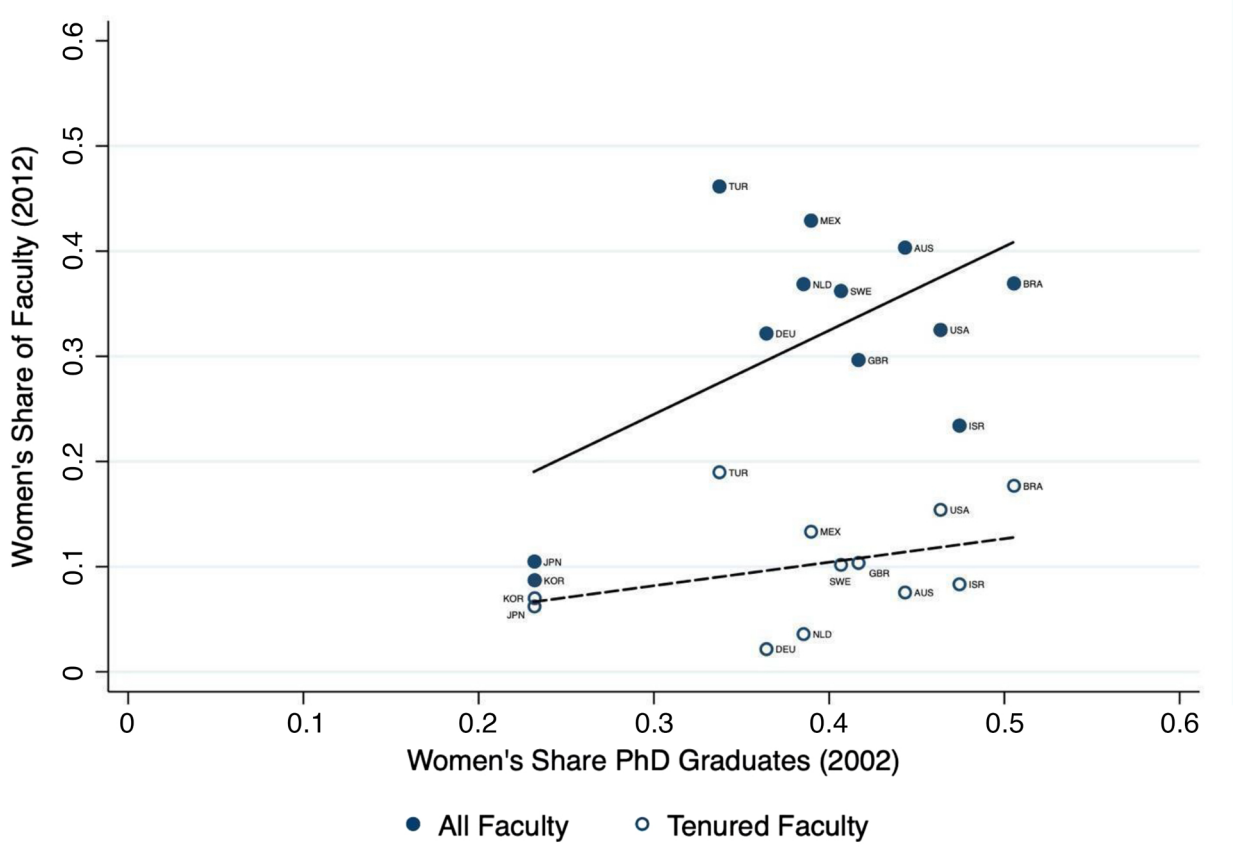

Figure 2: Women's share of PhD graduates in 2002 relative to women's share of all faculty in 2012.

subfields, as studies show some are more gender balanced or even dominated by women (Zengin-Arslan 2002).

National Higher Education System-Level Factors

In this section, we examine features of national higher education systems as they relate to the representation of women total and tenured women faculty. We begin by comparing women's status in higher education with women's share of doctoral degree graduates. Across the 13 countries in our study, the percentage of women doctoral graduates increased from 39 percent in 2002 to roughly 45 percent in 2014. This 2014 figure is demonstrably lower than the 55 percent of total tertiary graduates who were women in the 2014–2015 academic year, suggesting that while women are graduating from college and university at high rates, they are less likely to earn doctoral degrees that are necessary for faculty positions in most countries (UNESCO UIS 2014).[4]

Despite this gender gap, our data suggest a positive relationship between women's participation in higher education and representation among total and tenured faculty. As shown in Figure 2, women's share of doctoral graduates in 2002 has a strong positive association with women's share of total faculty

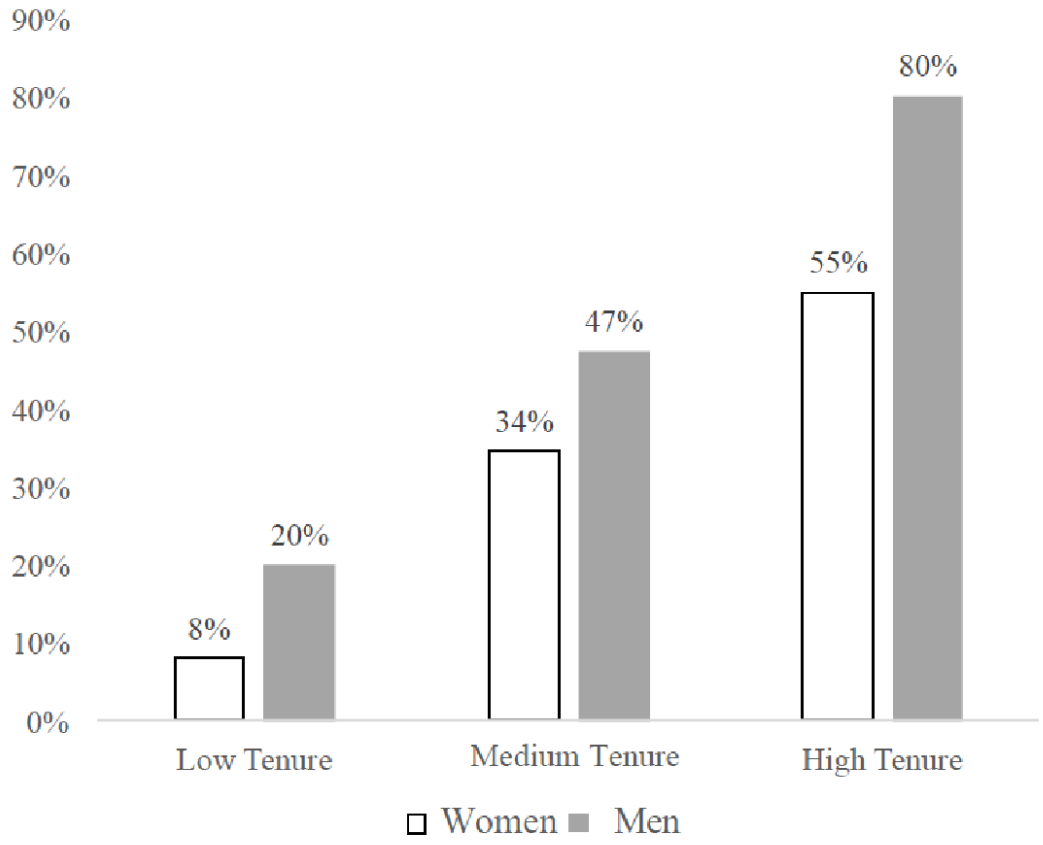

Figure 3: Share of tenured faculty by gender in low-, medium-, and high-tenure systems.

($r = 0.61$). Findings for individual countries correspond with outcomes reported above: women fare better in some countries (Turkey and Mexico) and worse in others (Japan and South Korea), and for most cases, the relationship is as expected. The relationship is less strongly correlated between women's share of doctoral graduates and tenured faculty, but it is still positive.

In a correlation matrix of percent tenured women and other factors, we see that the national share of tenured women is positively correlated with the share of doctoral graduates in 2002 (0.32) who are women and the percentage of total faculty who are women (0.44). The percentage of women who are tenured is also positively correlated with the percentage of total men who are tenured (0.13), suggesting that the availability of qualified women and the country-specific opportunities for tenure are both factors associated with tenure rates for women.

National opportunities for tenure appear to play an important role in determining the percentage of tenured women faculty. In our descriptive analyses, we draw on the existing literature to group countries into three classifications based on their tenure opportunities: low (less than 40 percent), medium (40–60 percent), and high (above 60 percent). These categories represent long-standing differences in university systems worldwide and map onto distinctive traditions. As expected,

Table 4: Logistic regression of factors associated with tenure (odds ratio).

	Model 1	Model 2	Model 3
Woman	0.54**	0.51**	0.51**
Biology		0.81**	0.81**
Engineering		0.70**	0.70**
Sociology		1.13	1.13
Medium tenure (reference)			1.00
Low-tenure system			0.21**
High-tenure system			4.83**
Constant	1.29	1.53	1.34
Variance of constant (country)	2.45	2.49	1.00
Variance of constant (university)	2.12*	2.10*	2.03**
Bayesian Information Criterion (BIC)	13092.03	13077.92	13063.02

Note: $N = 11,957$.
*$p < 0.05$, **$p < 0.01$ (two-tailed tests).

tenured faculty—men and women—are more likely to be found in higher education systems with higher tenure rates overall. As shown in Figure 3, in countries with low-tenure systems (e.g., Germany and the Netherlands), only 8 percent of women faculty are tenured (20 percent of men), compared to 55 percent of women (and 80 percent of men) in high-tenure systems (e.g., China, Japan, and South Korea). Although women are still under-represented in high-tenure systems (55 percent women vs. 80 percent men), among women who have faculty status, a relatively higher proportion have tenure. As faculty ranks shown in Table 1 do not reveal specific features of tenure systems that would explain these cross-national differences, further analyses are warranted.

Findings from the Multivariate Analysis

In Table 4, we report the findings of our regression analyses. Our dependent variable is a binary variable indicating whether a faculty member is tenured. In each model, we regress tenure status onto faculty gender, and as expected, being a woman is negatively associated with tenure status with statistical significance. The results indicate that the odds of a faculty member who is a woman being tenured is roughly half that of a faculty member who is a man.

Model 2 adds a binary variable for each field, with history as the reference category. Adding field-specific binaries controls for field-related differences in both tenure norms and women's share of the field's faculty, which ranges from 11 percent in engineering to 45 percent in sociology. Model 2 shows field-level differences in tenure rates. Although we cannot argue that earning tenure in some fields is *easier* than others, explanations for differences in tenure rates across fields are an area to be explored in future research. Importantly, controlling for field-specific tenure rate does not impact our primary variable of interest—gender, which remains statistically significant and negatively associated with the overall tenure rate.

Table 5: Logistic regression of factors associated with tenure (odds ratio).

	Low-Tenure System	Medium-Tenure System	High-Tenure System
Women (0/1)	0.32**	0.60**	0.30**
History (reference)	1.00	1.00	1.00
Biology	0.55*	0.90	0.90
Engineering	0.45**	0.74	0.95
Sociology	1.31	1.12	1.05
Constant	0.40**	1.21	6.68**
Variance (country)	1.00	1.00	1.00
Variance (university)	1.07	1.82**	5.12
N	3116	7195	1646

*$p < 0.05$, **$p < 0.01$ (two-tailed tests).

In model 3, we include a categorical variable for the three tenure rate systems: low, medium, and high, with medium-tenure rate countries as the reference group. After including a country's opportunity for tenure, the between-country variance reduces substantially to 1.0, which means that country-level variation is normally distributed. Furthermore, model 3 shows that women have lower odds of being tenured. However, the models point to significant differences in tenure rates for total faculty based on the tenure system, as expected in our hypotheses.

To determine the systems in which women faculty are least represented relative to men, we model gender and field separately for each tenure rate system (Table 5). Each model's coefficient on women shows the likelihood of women being tenured relative to men in each system. The models point to interesting differences across the tenure rate systems. In the low-tenure rate model (Germany and the Netherlands), country- and university-level variation in tenure status is slight, but biology and engineering faculty have lower tenure rates than sociology and history. In the low-tenure rate system, the odds of a faculty member who is a man obtaining tenured are three times higher than a faculty member who is a woman.

In contrast, in medium-tenure systems, which comprise most countries in our study, we find no country-level differences but significant variation at the university level. This is explained by a few universities in our sample with very high proportions of tenured faculty and others with very low proportions. It is noteworthy that in the medium-tenure rate systems, the odds of women faculty members being tenured are still lower than that of men, but the disadvantage for women is smaller in these systems. Men faculty members' likelihood of being tenured is 66 percent higher than women faculty members in medium-tenure rate systems, in contrast to 313 percent higher in the German and Dutch low-tenure rate systems.

In high-tenure rate systems, an individual's likelihood of being tenured is very high, with few differences across fields. However, as with the low-tenure rate system, women face significant disadvantages in this system. In these countries, the odds of a man faculty member being tenured are 3.3 times higher than a woman faculty member. These systems, all East Asian, represent situations where women are not earning the necessary credentials to become academics—in 2002, women made up less than 25 percent of doctoral graduates in Japan and South Korea, the

two countries for which we have data. By 2017, the percentages had increased somewhat—to 30.5 percent in Japan, 37.6 percent in South Korea, and 39.3 percent in China. These percentages remain low compared to other countries in the sample, for example, Australia and the United States had both reached gender parity (49.9 percent) in 2016–2017. Although East Asian countries are progressing at their own pace, concerns over persistent gender inequalities in academia in this part of the world continue to increase (Park 2007).

Overall, women are less likely to be tenured compared to men in all three types of tenure systems: low, medium, and high. However, women's relative disadvantage is smallest in medium-tenure systems, where more positions are available for advancement.

Table 5 presents regression models separately for each tenure type for ease of interpretation. However, as a robustness check, we also run a combined model in which we interact gender with tenure type (available from the authors upon request). The results are similar in sign and significance; men in medium- and high-tenure systems are much more likely to be tenured than men in low-tenure systems. Within each tenure system, women are much less likely to be tenured than their male counterparts, although women are least disadvantaged in medium-tenure systems. After controlling for both tenure system and gender, the national percentage of women doctoral graduates in 2002 is not a statistically significant predictor of tenure; therefore, we do not include it in Table 5.

Discussion

Higher education scholars and policymakers have problematized the unequal representation of women among university faculty, particularly given the context of the worldwide growth of women students in higher education. This study investigated national-level mechanisms underlying the gender composition of tenured faculty in globally ranked universities across four fields in 13 countries. Our findings point to cross-national differences for women faculty in our study due to national opportunities for tenure and the gender filter in STEM.

Structural Relationships

At the structural level, our findings suggest the presence of pipelines that relate to the percentages of qualified women with faculty positions. As others have found (Wotipka et al. 2018; Xie and Shauman 2003), we see a positive relationship between the percentage of women students and women faculty in higher education systems. Namely, there is a strong relationship between the percentage of women doctoral graduates and tenured women faculty a dozen years later, despite studies suggesting that women are "cooled out" of faculty positions (Etmanski 2019).

In explaining these positive relationships, the "chicken or the egg" question begs further attention. Growing numbers of universities and departments, especially in STEM fields, have policies and initiatives to hire and retain more women faculty (Timmers, Willemsen, and Tijdens 2010). These initiatives are mainly based on university motives to increase cognitive diversity and role modeling opportunities for

its increasingly diverse students, including women and minorities (Agathangelou and Ling 2002; Bettinger and Long 2005). There is some evidence that such initiatives lead to the growth of women faculty in specific countries and contexts (Fox and Stephan 2001). Other evidence suggests that tenure rates are becoming more similar for younger academics (Webber and Gonzalez Canché 2018). Does the presence of women faculty in these fields further enable women students to enter higher education at greater rates? It could be both.

The strong and significant relationship between these two groups is a non-trivial finding. In addition to the benefits of same-sex role models, the growing presence of women in high-status tenured faculty positions could have more pervasive effects. For instance, the mere visibility of women's expanding representation in faculty positions normalizes the presence and capabilities of women faculty across diverse fields (Sax et al. 2005). Similarly, both the increase in women students and women faculty reduces the "chilly climate" by changing the culture of departments and universities or the gender salience of faculty positions (Britton 2017). Given the importance of these mechanisms, future research could aim to uncover more nuanced understandings of how different causal pathways play out across countries and fields. Future studies could also examine more stages in the trajectory to faculty positions, such as increasingly important post-doctoral positions (Lörz and Mühleck 2019) and the progression not only to tenure but also to full professor or equivalent positions of the highest rank (D'Apice, Song, and Wotipka 2024).

Cross-National Variations

Our findings also reveal significant differences in tenured women faculty across countries in part due to national opportunities for tenure and also for other reasons. The situation for women in East Asia, especially in Japan and South Korea, is by far the most acute. These countries have the lowest proportions of women doctoral graduates, faculty and tenured faculty, and tenured faculty in all four fields. Even with substantial majorities of faculty being tenured in South Korea (more than 90 percent) and three-quarters in Japan, the tenure gap is the highest in these two countries. Such disparities have been explained by a mix of factors, such as women's employment choices, labor force discrimination (Kim, Yoon, and McLean 2010), and biased academic performance expectations (Park 2007). Some argue that meaningful changes may only come with rigorous, intentional policies specifically addressing gender-based discrimination in higher education (Monroe and Chiu 2010). Still, policies alone cannot serve as a silver bullet. Despite numerical gender targets created by the Japan Association of National Universities (Yonezawa 2019) and in national and public universities in South Korea (Kim et al. 2010), changes are still slow to be seen in these countries, especially at a time of increasing pressures for faculty to meet growing meritocratic and global standards for world-class university status (Byun, Jon, and Kim 2013; Huang 2015). When such efforts focus on STEM fields (Marginson 2018; Yonezawa 2013), this inevitably curbs the participation of women.

On the other end of the spectrum are countries where women's status in higher education has been improving and approaching parity. In the case of Turkey, the

Republic's modernization efforts allowed women of certain social classes to have access to the same educational and work opportunities as men (Sağlamer et al. 2018). Others argue that women prefer faculty careers over ones in industry in which women report facing bias and gaining fewer opportunities (Smith and Dengiz 2010). As Sağlamer et al. (2018:34) explain for Turkey, "Since the newly established universities did not have as deeply rooted traditions of male supremacy as their Western counterparts, they were much more flexible in accepting female students." The age of the university system may also partly explain the positive findings for Mexico and Brazil. In Mexico, the results for gender differences in research productivity are mixed (Padilla-Gonzalez et al. 2011; Rivera León, Mairesse, and Cowan 2017), but the fact that few faculty publish any research or that many faculty members work less than full-time may partly explain women's relative advantage in this system. Despite the relatively high numbers of women faculty in Brazil, women fare worse in some areas of the country where the most prestigious institutions are located (Moschkovich 2017). In addition to national opportunities for tenure, further research is needed to unpack the structural features of the higher education systems in these countries to understand the seemingly promising results from our analyses. Keeping track of and explaining the global growth in non-tenure-track positions is also important.

Field-Level Trends

Our findings support the assumption that rates of tenured women faculty are highest in fields in which women are better represented as students and faculty more generally. This aligns with work suggesting that women in disciplines having a "mixed gender composition" (within the range of a 40/60 gender composition) are more likely to remain in academia (Silander et al. 2013). Previous studies have found that countries with greater levels of structural differentiation are more likely to exhibit vertical and horizontal segregation among women students (Charles and Bradley 2002). Gender segregation among students across fields of study is maintained by obdurate, taken-for-granted gendered beliefs that continually influence students' educational choices and preferences (Beddoes and Pawley 2014; Cech 2013; Charles and Bradley 2002) and perpetuate stereotypical images of who is capable of becoming or promoted in faculty positions (Morley 2012). This "gender filter" leads to fewer women in tenured positions, particularly in male-dominated fields.

Conclusion

Given the limited sample size of countries and institutions, our study's findings should be interpreted with caution. Future research is needed to examine a broader landscape of women faculty in globally ranked universities while also considering changes in tenure systems since 2014. Future analyses with more country-level characteristics would allow a deeper understanding of how policies or university system features explain differences across countries with varying economic, political, and social conditions, particularly those directly impacting working women,

for example, parental leave policies (Lambert 2008). Despite these limitations, this study sheds light on key findings that can inform national and university policies to increase women's representation of tenured faculty in globally ranked universities. With more tenured women faculty, more women will be the creators and disseminators of new knowledge and innovation for the benefit of all.

Notes

1 We selected our countries based on those found in the original Carnegie Study on the Academic Profession (Altbach 1996) and The Changing Academic Profession project (Teichler et al. 2013), but we elected to make a few changes to arrive at this set of middle- and high-income countries.

2 We expected to have 208 departments: 13 countries $\times$ 4 universities $\times$ 4 fields $=$ 208. However, because the Netherlands does not have engineering departments in their typical universities, we ended up with 204 departments.

3 As a point of reference, these figures closely resemble those reported in Teichler et al. (2013) for most countries.

4 The average was calculated using UNESCO UIS Data Centre, "Graduates from tertiary education, both sexes" (2014). Countries with missing data were not calculated in the average.

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